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Longitudes of Sun 1900.

Corrections to Le Verrier's Tables.

Day.		Correction.	Day.		Correction.	Day.		Correction.
Jan.	1	−0″·43	May	9	−0″·04	Sept.	6	−0″·84
	9	−0·50		17	+0·12		14	−0·87
	17	−0·32		25	+0·09		22	−0·93
	25	−0·19	June	2	−0·07		30	−1·08
Feb.	2	−0·27		10	−0·07	Oct.	8	−0·97
	10	−0·22		18	−0·04		16	−0·93
	18	−0·07		26	−0·16		24	−1·17
	26	+0·02	July	4	−0·43	Nov.	1	−1·24
Mar.	6	−0·10		12	−0·42		9	−1·09
	14	−0·07		20	−0·35		17	−1·13
	22	+0·12		28	−0·56		25	−1·25
	30	+0·01	Aug.	5	−0·75	Dec.	3	−1·10
Apr.	7	−0·01		13	−0·70		11	−0·93
	15	+0·06		21	−0·70		19	−0·95
	23	+0·01		29	−0·82		27	−0·97
May	1	+0·01						

Nautical Almanac Office:
1895 *September* 9.

Description of a Mechanical Apparatus for computing Refractions.

By W. E. Cooke.

(*Communicated by Sir Charles Todd.*)

This consists essentially of two scales, B and F, sliding in parallel grooves, a movable pointer, P (shaded in the diagram), and two fixed scales for barometer and thermometer respectively.

A, C, E, G are narrow strips of metal serving as guides to the movable portions.

B is a strip of brass, 21 in. × 3 in. × $\frac{3}{16}$, on which are ruled divisions as follows: 17 longitudinal lines divide it into 18 rows, the fourth line from the top being rather thicker than the others. In making the short vertical graduations two different scales were used, one inch representing ·0200 for the first four rows, and three inches representing the same quantity for the remaining 14. The commencement of each row represents successively the logs. 0·3200, 0·6200, 0·9200, 1·2200, 1·4700, 1·5200, 1·5700, &c., to 2·1200, and the figures inscribed are the antilogs corresponding to the scale numbers thus obtained. (It will be noticed that the antilogs overlap, *i.e.* the figures at the end of

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each row are repeated at the commencement of the next; the amount of this overlap corresponds to at least ·0720.)

F is of the same width and thickness, but need not necessarily be quite as long as B, for very little overlap is required. The same scales as before are used. The commencement of each row represents successively 0·3000, 0·6000, 0·9000, 1·2000, 1·4500, 1·5000, 1·5500, &c., up to 2·1000, and the figures inscribed are the Z.D.s which correspond to the various logs according to the refraction tables published as an appendix to the Greenwich Observations of 1836. These extend from 3° to 71° Z.D.

B and F are each provided with a fine pointer which extends at right angles across the strips C and E respectively. These pointers may be affixed to any part of the edge. The movable (shaded) pointer, P, consists of a fine black thread stretched at right angles to B and F on a frame which slides in the groove D. The arm of this pointer is for convenience graduated from 1 to 18 to correspond with the rows in B and F. The barometer scale on C is laid down as follows. A point is arbitrarily selected, and the scale, with the graduations increasing to the left, is placed so that this arbitrary point reads 0·0200. The barometer readings corresponding to the various logs. as given in Table I. of the "Appendix" are then plotted, each scale being, of course, employed in turn. For the temperature curve a little more care is required, for it becomes necessary to employ Tables II. and IV. To obtain the zero point, B and F are moved until the pointer of B is on ·0200 of the barometric scale and the initial lines on B and F are collinear (as indicated by the movable thread); the pointer of F will now indicate the zero point for temperature. The small scale (giving Z.D.s 0° to 30°) can be used in a similar manner to that just indicated for the barometer, but the logs must increase to the left, and the zero point will correspond to ·0000. With the large scale the temperatures can also be put down from Table II., and these will be the correct readings for Z.D.s up to 45°. In order to obtain the top line (Z.D. 70°) we must add together the figures for 70° Z.D. in Table IV. and those in Table II. We now connect corresponding points by short straight lines, and intermediate longitudinal lines can be drawn to represent the various Z.D.s between 45° to 70°. (I am afraid that in the diagram the line for 60° Z.D. is not very accurately laid down.)

To use the apparatus.—Move B, by means of the slow-motion screw, until the pointer stands opposite the correct barometer reading; move F to the proper temperature reading, and move the thread to the proper reading of Z.D., as shown in one or other of the rows on F. The thread reading on the corresponding row of B will be the refraction required.

It will be found that if this apparatus be carefully graduated on the scale indicated, refractions can be obtained with certainty to the nearest tenth of a second of arc, and with a little care the error will never exceed two or three hundredths.

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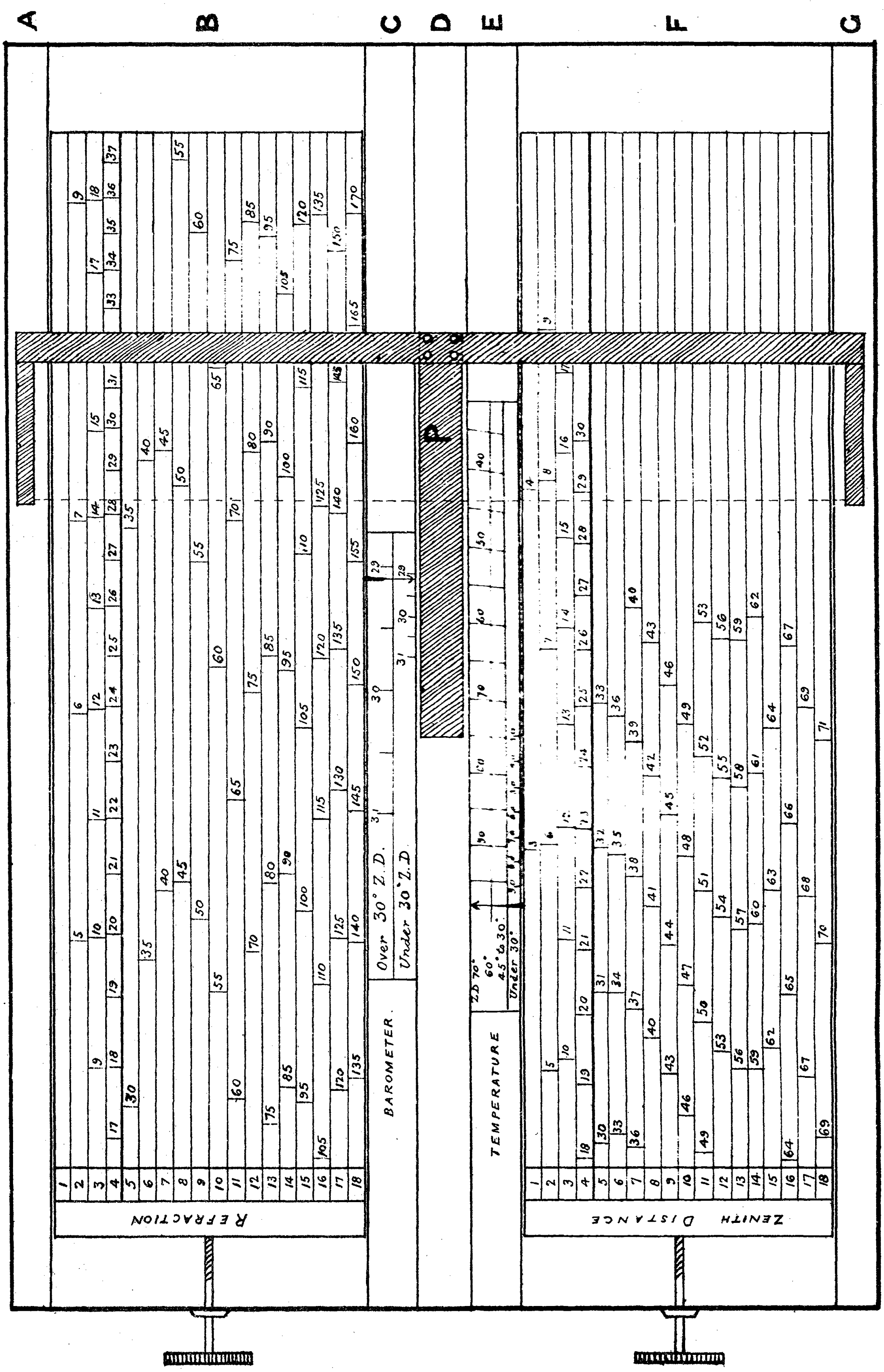

APPARATUS FOR COMPUTING REFRACTIONS.

SPOTTISWOODE & CO. LITH. LONDON.